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(71) Applicant
Spiroflow UK (Machinery) Limited
(Incorporated in the United Kingdom)

Upbrooks, Clitheroe, Lancashire, BB7 1QG,
United Kingdom

(72) Inventor
Michael John Podevyn

(74) Agent and/or Address for Service
Appleyard Lees
15 Clare Road, Halifax, West Yorkshire, HX1 2HY,
United Kingdom

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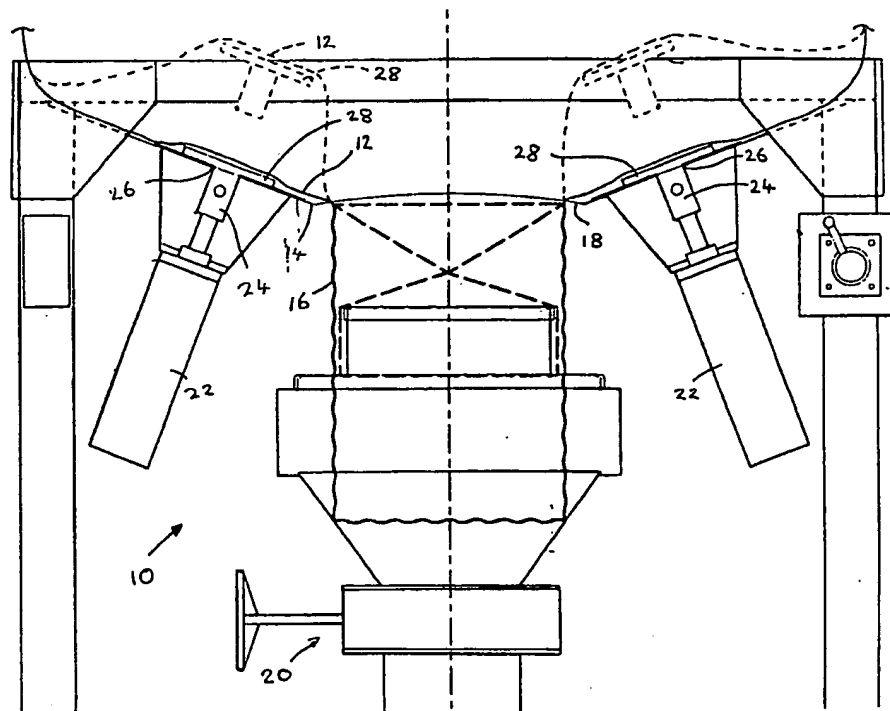
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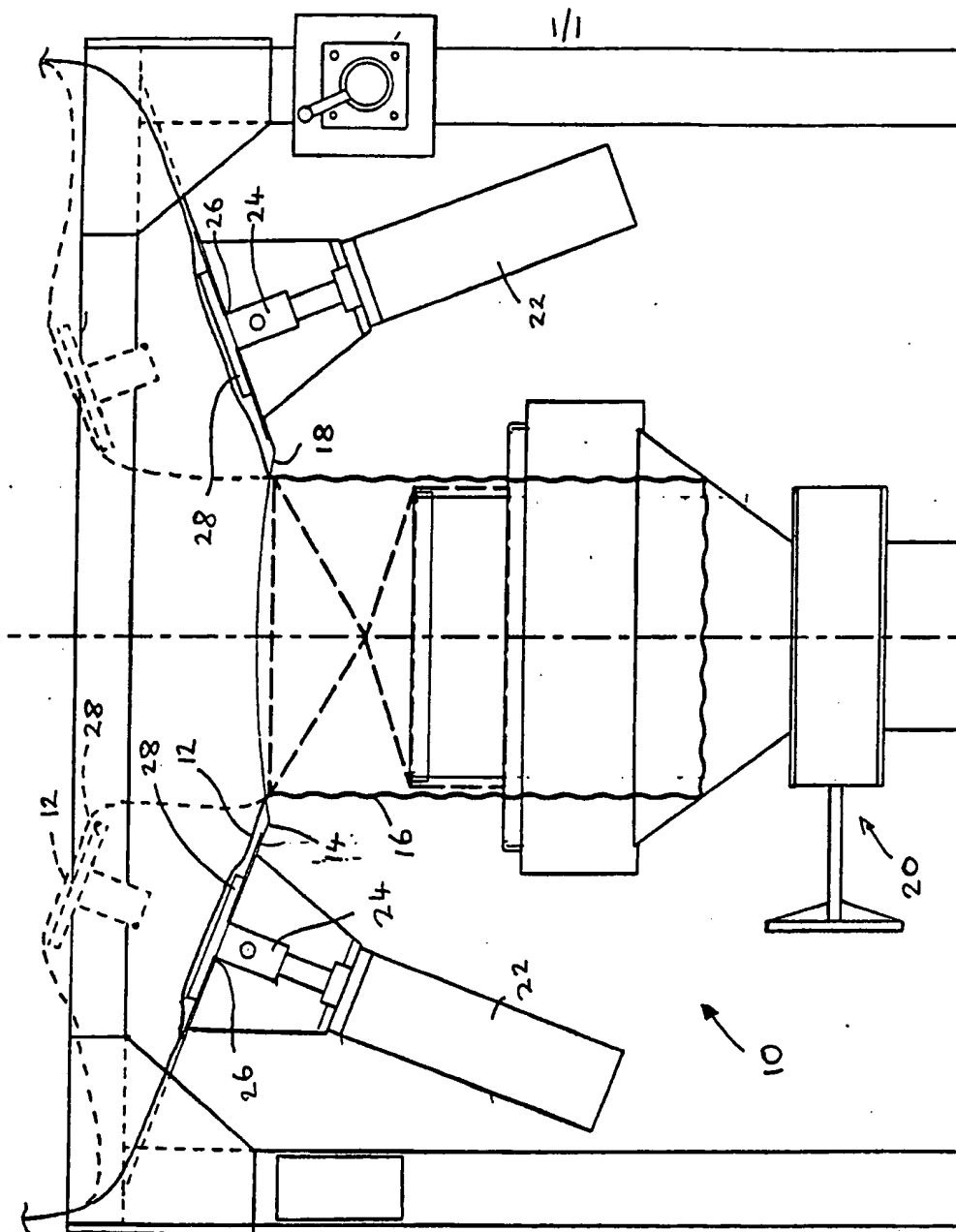
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(54) Discharge of material from flexible containers

(57) Pushing plates 28 are reciprocated to and fro on rams 24 in order to cause the wall of a bag 12 to be pushed inwardly or to allow the walls to be lowered outwardly in order to cause the material in the bag to move and break up, or prevent the formation of, a bridge above an outlet nozzle 16.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.
The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.



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IMPROVEMENTS IN OR RELATING TO DISCHARGE OF MATERIAL FROM
FLEXIBLE CONTAINERS.

The present invention relates to a method of discharging material from an at least partially flexible container and to flexible container discharge apparatus.

It is known to suspend flexible bags containing material with the bottom of these bags being supported on a rigid platform. Material is discharged through a nozzle extending down from the bottom of the bag and, in order to assist in the discharge, the platform is vibrated. However, the vibration of the platform is only of limited use in attempting to break up the material in the bag and prevent the formation of any bridges above the outlet, and the vibration does not necessarily work on all types or consistencies of material. Furthermore the machinery may suffer wear and fatigue as a result of the repeated vibrations, and the vibrating mechanism requires repeated maintenance.

According to one aspect of the present invention a method of discharging material from an at least partially flexible container comprises changing the shape of the container and thereby causing movement of material within the container.

The method may comprise changing the shape at a plurality of locations.

The method may comprise changing the shape of a downwardly facing portion of the container.

The method may comprise pushing a wall of the container inwardly and, alternatively or additionally,

allowing the wall of the container to move outwardly.

The method may comprise repeatedly changing the shape of the container.

The method may comprise continually changing the shape of the container.

The method may comprise changing the shape of the container in the region of an outlet from the container.

The method may comprise changing the shape of the container on commencement of discharge from the container, or after commencement of discharge therefrom.

The method may comprise supporting at least a part of the container whilst changing the shape of the container.

According to another aspect of the present invention, flexible container discharge apparatus includes means arranged to change the shape of an at least partially flexible container.

The means may be arranged to change the shape of a downwardly facing surface of a container.

The means may be arranged to change the shape of a container at a plurality of locations on that container.

The means may be arranged to push the wall of a container inwardly.

The means may be arranged to allow the wall of the container to move outwardly.

The means may be arranged to continually change the shape of a container during discharge of that container.

The means may be arranged to repeatedly change the shape of a container during discharge of the container.

The means may be arranged to change the shape of the container in the region of an outlet from a container.

The means may be arranged to support a part of a container.

The means may include an abutment movable relative to a container.

The apparatus may include a support for a container. The abutment, in one position, may be arranged to be located on the support for the container. The abutment may be movable away from the support towards a container.

The abutment may be movable on a driven member extending through the support. The driven member may be pneumatically actuable to move through the support.

The present invention also includes a flexible container when associated with the discharge apparatus as herein referred to, and the present invention also includes a flexible container when associated with a

discharge apparatus when used in a method as herein referred to.

The present invention may be carried into practice in various ways but one embodiment will now be described by way of example and with reference to the accompanying drawing which is a side view of a discharge hopper 10 containing a flexible bag 12, only the lower portion of which is shown.

The bag 12 is supported above the ground on a rigid platform 14 which extends across the bottom of the bag. The bag is suspended from above by ties (not shown), and the sides of the bag may be supported by a rigid cylindrical wall (not shown), if desired.

The bag 12 includes a flexible outlet nozzle 16 which is passed through a central opening 18 in the platform, and the nozzle 16 extends downwardly to a valve 20 which can be opened and closed to control the discharge of material from the bag through the nozzle.

Two pneumatic cylinders 22 are secured to the downwardly facing surface of the platform on either side of the opening 18, and rams 24 from each cylinder pass through openings 26 in the platform. Pushing plates 28 are secured to the free ends of the rams 24.

In use, when a bag is being located on the platform without discharge having commenced, the plates 26 lie on the upwardly facing surface of the platform and the rams are in a retracted position. Either on commencement of the discharge or after discharge has started the rams can be moved to an extended position, as shown in chain lines, to cause the wall of the bag to be

pushed inwardly at each location to the positions shown in chain lines by the plates 28 thereby preventing a bridge of material from forming above the outlet in the bag, which bridge would impede or prevent discharge, or breaking any bridge which has formed. The rams are then moved to the retracted position to allow the lowering of the wall of the bag on each plate, again causing the material in the bag to move to break up, or to prevent the formation of a bridge.

The rams may be moved repeatedly between the extended and retracted positions or periodically between those positions. The rams may be moved simultaneously between the extended and retracted positions. Alternatively the rams may be moved alternately between the extended and retracted positions. One of the rams may have started to move to the extended position, or be at the extended position or have started to return to the retracted position before the other ram starts to move towards the extended position from the retracted position.

The plates 26 may massage the material within the bag and may flex or deform or distort the wall.

In an alternative embodiment (not shown) more than two pneumatic cylinders may be mounted on the underside of the platform, each with their own ram and associated plate located on the upwardly facing side of the platform.

Alternatively or additionally one or more pneumatic cylinders with an associated ram and plate may be located such that the plate pushes on an upwardly extending wall of the bag onto the material located

within the bag.

Although the present specification has described the pushing in and allowing out of the wall of the bag up on actuation of pneumatic cylinders, it will be appreciated that any suitable driving means may be used.

CLAIMS

1. A method of discharging material from an at least partially flexible container comprising changing the shape of the container and thereby causing movement of material within the container.
2. A method as claimed in Claim 1 comprising changing the shape of the container at a plurality of locations.
3. A method as claimed in Claim 1 or 2 comprising changing the shape of a downwardly facing portion of the container.
4. A method as claimed in any preceding claim comprising pushing a wall of the container inwardly.
5. A method as claimed in any preceding claim comprising allowing the wall of the container to move outwardly.
6. A method as claimed in any preceding claim comprising repeatedly changing the shape of the container.
7. A method as claimed in any preceding claim comprising continually changing the shape of the container.
8. A method as claimed in any preceding claim comprising changing the shape of the container in the region of an outlet from the container.
9. A method as claimed in any preceding claim comprising changing the shape of the container on commencement of discharge from the container.

10. A method as claimed in any of Claims 1 to 8 comprising changing the shape of the container after commencement of discharge from the container.
- 5 11. A method as claimed in any preceding claim comprising supporting at least a part of the container whilst changing the shape of the container.
- 10 12. A method of discharging material from an at least partially flexible container substantially as herein described with reference to, and as shown in the accompanying drawings.
- 15 13. Flexible container discharge apparatus including means arranged to change the shape of an at least partially flexible container.
- 20 14. Apparatus as claimed in Claim 13 in which the means which are arranged to change the shape of an at least partially flexible container are arranged to change the shape of a downwardly facing surface of that container.
- 25 15. Apparatus as claimed in Claim 13 or 14 in which the means that are arranged to change the shape of an at least partially flexible container are arranged to change the shape of that container at a plurality of locations on that container.
- 30 16. Apparatus as claimed in any of Claims 13 to 15 in which the means which are arranged to change the shape of an at least partially flexible container are arranged to push the wall of the container inwardly.
- 35 17. Apparatus as claimed in any of Claims 13 to 16 in which the means which are arranged to change the shape of

an at least partially flexible container are arranged to allow the wall of the container to move outwardly.

18. Apparatus as claimed in any of Claims 13 to 17 in which the means which are arranged to change the shape of an at least partially flexible container are arranged to continually change the shape of that container during discharge of that container.

19. A method as claimed in any of Claims 13 to 18 in which the means which are arranged to change the shape of an at least partially flexible container are arranged to repeatedly change the shape of that container during discharge of the container.

20. Apparatus as claimed in any of Claims 13 to 19 in which the means which are arranged to change the shape of an at least partially flexible container are arranged to change the shape of that container in the region of an outlet from that container.

21. Apparatus as claimed in any of Claims 13 to 20 in which the means which are arranged to change the shape of an at least partially flexible container are arranged to support a part of that container.

22. Apparatus as claimed in any of Claims 13 to 21 in which the means which are arranged to change the shape of an at least partially flexible container include an abutment movable relative to that container.

23. Apparatus as claimed in any of Claims 13 to 22 including a support for a container.

24. Apparatus as claimed in Claims 22 and 23 in which the abutment, in one position, is arranged to be located on the support for the container.

5 25. Apparatus as claimed in Claim 24 in which the abutment is movable away from the support towards a container.

10 26. Apparatus as claimed in Claim 24 or 25 in which the abutment is located on a driven member extending through the support.

15 27. Apparatus as claimed in Claim 26 in which the driven member is pneumatically actuatable to move through the support.

20 28. Flexible container discharge apparatus substantially as herein described with reference to, and as shown in the accompanying drawings.

29. A flexible container associated with a discharge apparatus as claimed in any of Claims 13 to 28.

25 30. A flexible container when being discharged by a method as claimed in any of Claims 1 to 12.